

CLAIMS:

1. A greenhouse comprising:

an exterior wall structure having an end wall and two side walls at right angles to the end wall, each of which includes primarily transparent panels allowing entry to an interior of natural light;

a plurality of elongate parallel benches located side by side within the interior at right angles to the end wall and arranged to provide generally horizontal support surfaces for supporting plant materials thereon for receiving the natural light and growing within the interior;

and a lighting system for supplying artificial light to the plant materials on the support surfaces comprising a plurality of rails arranged in parallel spaced positions in a common horizontal plane at a height above the benches with the rails extending parallel to the benches;

each rail supporting a plurality of the lighting fixtures in a row along the rail;

each lighting fixture comprising:

a mounting member for attachment to the respective rail;

a generally parabolic reflector carried on the mounting member so as to be depended facing generally downwardly toward the plant material for directing light toward the plant material;

a lighting bulb support for receiving and supporting a bulb at a position within the parabolic reflector such that light therefrom is reflected by the reflector;

wherein the mounting member of each lighting fixture is pivotal about
5 an axis generally parallel to a parabolic axis of the parabolic reflector relative to the parabolic reflector and to the bulb support so as to adjust the angle of the directed light relative to the rail;

and wherein that row of lighting fixtures adjacent each side wall has the lighting fixtures adjusted such that the lighting direction is angled downwardly
10 and inwardly of the respective side wall.

2. The greenhouse according to Claim 1 wherein the bulb support is movable relative to the parabolic reflector so as to move the bulb within the axial plane of the parabolic reflector so as to move the bulb relative to the parabolic axis.

3. The greenhouse according to Claim 2 wherein the parabolic
15 reflector has end walls at right angles to the plane and the bulb support is movable along end walls.

4. The greenhouse according to Claim 1 wherein the parabolic reflector has a generally parabolic shape with a recessed notch in the reflector at the axial plane.

20 5. The greenhouse according to Claim 1 wherein the recessed notch is V-shaped.

6. The greenhouse according to Claim 1 wherein the parabolic reflector has end walls at right angles to the plane and has inclined ends panels extending from the end walls inwardly and upwardly toward the top of the parabolic shape.

5 7. The greenhouse according to Claim 1 wherein the end wall has a plurality of posts at spaced positions along the end wall and there are provided beams mounted on the posts and extending parallel to the side walls between the side walls and wherein the rails include a plurality of inner rails aligned with posts and beams and two outer rails each adjacent a respective one of the side walls.

10 8. The greenhouse according to Claim 7 wherein the rails are interconnected to form an array and are suspended from the beams for common height adjustment of the array.

 9. The greenhouse according to Claim 8 wherein the rail height is adjustable to provide an adjustable spacing from top of crop material so that the
15 height can be adjusted to provide a predetermined spacing from the crop as the crop material grows and wherein the reflectors of the array are designed to maximize light intensity at the predetermined spacing.

 10. The greenhouse according to Claim 9 wherein the predetermined spacing is of the order of 5 feet.

20 11. The greenhouse according to Claim 1 wherein each light fixture is associated with a ballast and wherein the ballasts of all the lighting fixtures of the

array are associated together in at least one electrical cabinet mounted separately of the lighting fixtures.

12. The greenhouse according to Claim 11 wherein the exterior wall structure is formed from a plurality of posts and wall panels spanning the posts and wherein the at least one cabinet is mounted in wall panel.

13. A greenhouse comprising:

an exterior wall structure having an end wall and two side walls at right angles to the end wall, each of which includes primarily transparent panels allowing entry to an interior of natural light;

a plurality of elongate parallel benches located side by side within the interior at right angles to the end wall and arranged to provide generally horizontal support surfaces for supporting plant materials thereon for receiving the natural light and growing within the interior;

and a lighting system for supplying artificial light to the plant materials on the support surfaces comprising a plurality of rails arranged in parallel spaced positions in a common horizontal plane at a height above the benches with the rails extending parallel to the benches;

each rail supporting a plurality of the lighting fixtures in a row along the rail;

each lighting fixture comprising:

a mounting member for attachment to the respective rail;

a generally parabolic reflector carried on the mounting member so as to be depended facing generally downwardly toward the plant material for directing light toward the plant material;

a lighting bulb support for receiving and supporting a bulb at a position within the parabolic reflector such that light therefrom is reflected by the reflector;

wherein the bulb support is movable relative to the parabolic reflector so as to move the bulb within the axial plane of the parabolic reflector so as to move the bulb relative to the parabolic axis to accommodate different types of bulb.

10 14. A greenhouse comprising:

an exterior wall structure having an end wall and two side walls at right angles to the end wall, each of which includes primarily transparent panels allowing entry to an interior of natural light;

15 a plurality of elongate parallel benches located side by side within the interior at right angles to the end wall and arranged to provide generally horizontal support surfaces for supporting plant materials thereon for receiving the natural light and growing within the interior;

20 and a lighting system for supplying artificial light to the plant materials on the support surfaces comprising a plurality of rails arranged in parallel spaced positions in a common horizontal plane at a height above the benches with the rails extending parallel to the benches;

each rail supporting a plurality of the lighting fixtures in a row along the rail;

each lighting fixture comprising:

a mounting member for attachment to the respective rail;

5 a generally parabolic reflector carried on the mounting member so as to be depended facing generally downwardly toward the plant material for directing light toward the plant material;

a lighting bulb support for receiving and supporting a bulb at a position within the parabolic reflector such that light therefrom is reflected by the reflector;

10 wherein the end wall has a plurality of posts at spaced positions along the end wall and there are provided beams mounted on the posts and extending parallel to the side walls between the side walls and wherein the rails include a plurality of inner rails aligned with posts and beams and two outer rails each adjacent a respective one of the side walls;

and wherein the rails are interconnected to form an array and are suspended from the beams for common height adjustment of the array.

15 15. The greenhouse according to Claim 14 wherein the rail height is adjustable to provide an adjustable spacing from top of crop material so that the height can be adjusted to provide a predetermined spacing from the crop as the crop material grows and wherein the reflectors of the array are designed to maximize light intensity at the predetermined spacing.

16. The greenhouse according to Claim 15 wherein the predetermined spacing is of the order of 5 feet.

17. A greenhouse comprising:

an exterior wall structure having an end wall and two side walls at right angles to the end wall, each of which includes primarily transparent panels allowing entry to an interior of natural light;

a plurality of elongate parallel benches located side by side within the interior at right angles to the end wall and arranged to provide generally horizontal support surfaces for supporting plant materials thereon for receiving the natural light and growing within the interior;

and a lighting system for supplying artificial light to the plant materials on the support surfaces comprising a plurality of rails arranged in parallel spaced positions in a common horizontal plane at a height above the benches with the rails extending parallel to the benches;

each rail supporting a plurality of the lighting fixtures in a row along the rail;

each lighting fixture comprising:

a mounting member for attachment to the respective rail;

a generally parabolic reflector carried on the mounting member so as to be depended facing generally downwardly toward the plant material for directing light toward the plant material;

a lighting bulb support for receiving and supporting a bulb at a position within the parabolic reflector such that light therefrom is reflected by the reflector;

wherein the parabolic reflector has a generally parabolic shape with a recessed notch in the reflector at the axial plane.

18. The greenhouse according to Claim 17 wherein the recessed notch is V-shaped.

19. The greenhouse according to Claim 17 wherein the parabolic reflector has end walls at right angles to the plane and has inclined ends panels extending from the end walls inwardly and upwardly toward the top of the parabolic shape.

20. The greenhouse according to Claim 17 wherein the bulb support is movable relative to the parabolic reflector so as to move the bulb within the axial plane of the parabolic reflector so as to move the bulb relative to the parabolic axis to accommodate different types of bulb.

21. The greenhouse according to Claim 20 wherein the parabolic reflector has end walls at right angles to the plane and the bulb support is movable along end walls.

22. A greenhouse comprising:
an exterior wall structure having an end wall and two side walls at right angles to the end wall, each of which includes primarily transparent panels allowing entry to an interior of natural light;

a plurality of elongate parallel benches located side by side within the interior at right angles to the end wall and arranged to provide generally horizontal support surfaces for supporting plant materials thereon for receiving the natural light and growing within the interior;

- 5 and a lighting system for supplying artificial light to the plant materials on the support surfaces comprising a plurality of rails arranged in parallel spaced positions in a common horizontal plane at a height above the benches with the rails extending parallel to the benches;

 each rail supporting a plurality of the lighting fixtures in a row along the
10 rail;

 each lighting fixture comprising:

 a mounting member for attachment to the respective rail;

 a generally parabolic reflector carried on the mounting member so as to be depended facing generally downwardly toward the plant material for
15 directing light toward the plant material;

 a lighting bulb support for receiving and supporting a bulb at a position within the parabolic reflector such that light therefrom is reflected by the reflector;

 wherein each light fixture is associated with a ballast and wherein the
20 ballasts of all the lighting fixtures of the array are associated together in at least one electrical cabinet mounted separately of the lighting fixtures.

23. The greenhouse according to Claim 22 wherein the exterior wall structure is formed from a plurality of posts and wall panels spanning the posts and wherein the at least one cabinet is mounted in wall panel.